

Vol. 14

June, 1949

No. 2

CASTANEA

The Journal
of the
Southern Appalachian Botanical Club

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PUBLISHED FOR THE CLUB
MARCH, JUNE, SEPTEMBER, DECEMBER
at
West Virginia University
Morgantown, W. Va.

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All persons interested in the botany of the Southern Appalachian Mountains are invited to join the club. Dues, including subscription to the Journal, are \$3.00 per year. Single copies of *Castanea*, seventy-five cents.

Notes and short scientific papers relating to the botany of the region are welcomed and will be published to the extent that the size of the Journal allows.

Authors will receive six gratuitous copies of the issue in which their papers appear. Separate reprints, if ordered in advance, will be furnished at cost.

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The Journal of the Southern Appalachian Botanical Club

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The Violets of West Virginia*†

H. A. Davis and Tyrecca Davis

Illustrations by Elizabeth Davis Swiger

INTRODUCTION

Brainerd, in his *Violets of North America*,¹ describes 75 species of *Viola* native to the United States, of which 51 or 52 are found east of the Mississippi River. Half of these, or 26, are native to West Virginia. One other, *V. Priceana*, not recognized as a species by Brainerd, has been found within our borders. These 27 species of *Viola*, and the green violet, *Hybanthus concolor*, are discussed in the present paper. All drawings were made from specimens collected in West Virginia and preserved in our private herbarium, or in the West Virginia University Herbarium. Following the description of each species is a list of counties from which specimens are preserved in the W. V. U. Herbarium. Most species occur, and will eventually be collected, in many more counties.

No introduced species, unless it be *V. Rafinesquii*, is included in our discussion. In fact, we know of no colonies of introduced violets, other than *V. Rafinesquii*, which appear to be definitely established. The most likely prospect is the European *V. arvensis*. Forms of *V. tricolor* and *V. cornuta* often persist after cultivation. The more recently introduced *V. saxatile* seems better able to take care of itself, and may, in time, become established.

If one wishes to look for violets new to the state, we suggest he go to Canaan Valley (Tucker Co.), Cranesville (Preston Co.), or Gandy Creek (Randolph Co.), and search for *V. incognita* and *V. renifolia*. If one wishes to describe new species, we suggest that he

*The publication of this paper has been aided by a grant from West Virginia University.

†Contribution No. 47 from the Herbarium of West Virginia University.

go to the mountains of central West Virginia and study the stemless blues. We know of several colonies which do not fit into the following treatment.

EXCLUDED SPECIES

V. missouriensis Greene. Reported from Raleigh Co.⁴ We have examined the specimen upon which this report was based and believe the identification to be incorrect. The known range of *V. missouriensis* is in the Mississippi Valley, Indiana and Kansas to Louisiana and Texas.

V. novae-angliae House. Reported from Monongalia Co.⁵ The specimen on which this report was based is, in our opinion, *V. emarginata* Le Conte. The range of *V. novae-angliae* is far to the north, from Maine and New Brunswick along the Canadian border to Wisconsin.

V. labradorica Schrank. The report from Fayette Co.⁶ is no doubt due to confusion in nomenclature. *V. conspersa* has been called *V. labradorica* by some authors. As now understood, *V. labradorica* is found from Greenland to New Hampshire and New York.

We wish to thank Professor Earl L. Core for his help and encouragement in our violet studies.

KEY TO THE VIOLETS OF WEST VIRGINIA

I. Plants stemless.

1. All petals beardless; no cleistogamous flowers. 1. *Viola pedata*.
1. Some or all petals bearded; cleistogamous flowers present, at least in summer.
 2. Flowers violet-blue to purple (white in albino forms); rootstock stout; no stolons present. (BLUE VIOLETS)
 3. Some or all leaves lobed.
 4. Leaves mostly truncate at base, palmately 5-9 lobed; sepals not ciliate. 2. *V. palmata*.
 4. Leaves cordate at base, some hastately 3-5 lobed; sepals ciliate. 3. *V. triloba*.
 4. Leaves lanceolate or narrowly oblong, with incised basal lobes. 4. *V. sagittata*.
 3. Leaves not lobed.
 4. Leaves longer than wide, sharply toothed near the base.
 5. Leaves lanceolate, the petioles longer than the blades; plants normally glabrous (pubescent forms occur). 4. *V. sagittata*.
 5. Leaves ovate-oblong; petioles mostly shorter than the blades; plants normally pubescent (glabrous forms occur). 5. *V. fimbriatula*.
 5. Leaves triangular, truncate or slightly cordate at base; petioles mostly longer than the blades; plants glabrous. 6. *V. emarginata*.

4. Leaves heart-shaped, deeply cordate at base, about as long as wide; leaf margins rather uniformly crenate-serrate.
5. Plants decidedly pubescent.
 6. Pubescence confined to upper surface of leaves.
 7. *V. hirsutula*
 6. Petioles, peduncles, and young leaves densely pubescent.
 8. *V. sororia*
5. Plants essentially glabrous (often some pubescence on young leaves and petioles).
 6. Cleistogamous flowers ovoid, on short, curved peduncles, their purple or purple-dotted capsules on the ground; flowers among or slightly above the leaves.
 7. Flowers typically violet; pale forms paler toward the center.
 9. *V. papilionacea*
 7. Flowers white, suffused with blue so as to appear gray; darker toward the center.
 10. *V. Priceana*
 6. Cleistogamous flowers ovoid, on long ascending peduncles; sepals with short appressed auricles; capsules green or purple dotted; flowers among or slightly above the leaves.
 11. *V. affinis*
 6. Cleistogamous flowers long and slender, on long erect peduncles; sepals with long auricles; capsules green; flowers high above the leaves.
 12. *V. cucullata*
2. Flowers white, with delicate purple striations; rootstock slender; leafy stolons present in summer. (SWEET WHITE VIOLETS)
 3. Leaves heart-shaped, deeply cordate at base; petioles not margined.
 4. Leaves acute, with scattered hairs above; petioles and peduncles reddish; plants of moist woods.
 13. *V. blanda*
 4. Leaves mostly obtuse or rounded, glabrous; petioles and peduncles green, sometimes with reddish dots; plants of mountain bogs.
 14. *V. pallens*
 3. Leaves lanceolate, tapering into margined petioles.
 15. *V. lanceolata*
 3. Leaves ovate, at least some tapering into margined petioles, others truncate, or slightly cordate.
 16. *V. primulifolia*
2. Flowers yellow; rootstock stout.
 17. *V. rotundifolia*

II. Plants with leafy stems.

1. Flowers yellow; stipules entire. (YELLOW VIOLETS)
 2. Some leaves lobed or divided.
 18. *V. tripartita*
 2. None of the leaves lobed or divided.
 3. Leaves hastate, 2-4 at the summit of the stem; stipules less than 3 mm. long.
 19. *V. hastata*
 3. Leaves heart-shaped; stipules more than 5 mm. long.
 4. Stems 1-3, erect; basal leaves absent, or one with long petiole; leaves crowded at top of stem; plants softly pubescent, especially when young.
 20. *V. pubescens*
 4. Stems several, ascending, leafy; basal leaves present; plants sparingly pubescent or glabrous.
 21. *V. eriocarpa*
 1. Flowers not yellow.
 2. Flowers green.
 28. *Hybanthus concolor*
 2. Flowers white with yellow eye, pale lavender on back; stipules lanceolate, entire.
 22. *V. canadensis*
 2. Flowers white or cream, with purple striations; stipules fimbriate.
 23. *V. striata*
 2. Flowers some shade of violet or violet-purple (white only in albino forms).
 3. Perennials; stipules not leaf-like.

- | | |
|--|-----------------------------|
| 1. Spur 8-12 mm. long; stems ascending. | 24. <i>V. rostrata</i> . |
| 4. Spur 4-6 mm. long; stems ascending. | 25. <i>V. conspersa</i> . |
| 4. Spur 2-6 mm. long; stems prostrate, rooting at the nodes. | 26. <i>V. Walteri</i> . |
| 3. Annual; stipules leaf-like. | 27. <i>V. Rafinesquii</i> . |

1. ***Viola pedata* L.** Bird-foot Violet. Plate 1.

A beautiful, cut-leaved, large-flowered violet found on dry, shaly banks.

Rootstock erect, short, and stout; roots long and comparatively few; leaves 3-divided, the lateral divisions 3-5-parted or-cleft, the divisions linear or cuneate, few toothed at the apex; early and late leaves less dissected; leaves more or less ciliate with inward-curving hairs; plant otherwise glabrous; flowers all petaliferous, about 3 cm. wide; petals all beardless, the upper pair dark violet, the others pale to deep lilac-purple; flowers produced in profusion and held well above the foliage in early spring. The few which appear at intervals throughout the summer and autumn are usually smaller and shorter; peduncled.

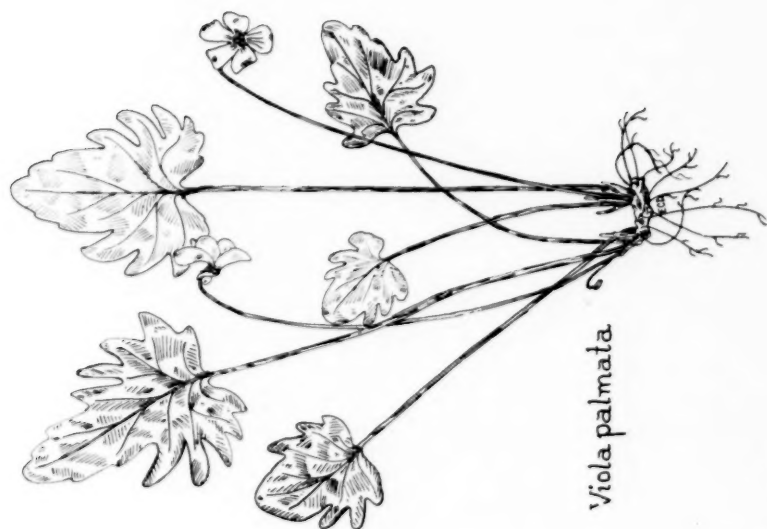
In dry, shaly places, mostly in the southeastern parts of the state. Specimens seen from Berkeley, Fayette, Grant, Greenbrier, Hampshire, Hardy, Mercer, Mineral, Monroe, Morgan, Summers, and Wayne Counties.

***Viola pedata* var. *lineariloba* DC.**

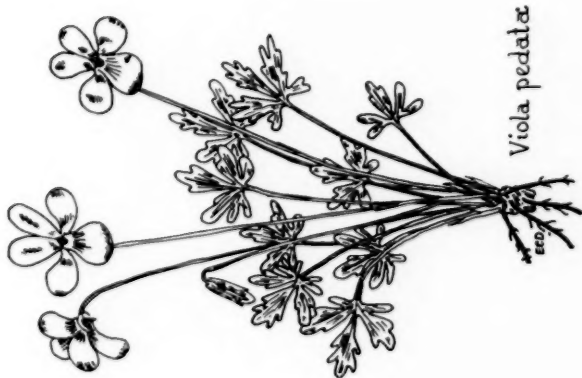
Differs from the species in having all five petals of the same color.

With the species. The above county records refer to the species, the variety, or both.

The bird-foot is our largest flowered and most beautiful violet. It is often seen in the eastern part of the state growing luxuriantly on hard, dry shale banks. The color of the petals is quite variable, especially in the variety *lineariloba*, which occurs in all shades from a deep lilac-purple through pale orchid to pure white. There is also a great variation in the extent to which the leaves are divided. However, we have never been able to discern any consistent difference between the leaves of the species and those of the var. *lineariloba*. It seems that the name is non-descriptive.



Viola palmata



Viola pedata

2. ***Viola palmata* L.** Palmate-leaved Violet. Plate 1.

A pubescent blue violet with nearly all leaves palmately lobed.

Rootstock knotted, horizontal or ascending, often branched; leaves truncate or slightly cordate at base, all or nearly all palmately 5-11-lobed or -parted, the segments linear, variously toothed, the middle segment largest, but seldom half the leaf area, usually much less; petioles and under leaf surface densely villous, upper surface often glabrous; sepals scarious margined, rarely a little ciliate toward the base; cleistogamous capsules ovoid, purple dotted, 8-12 mm. long; seeds brown.

Widely distributed in dry woods throughout the state. Specimens seen from Cabell, Calhoun, Fayette, Hampshire, Kanawha, Lincoln, Marion, Monongalia, Monroe, Ohio, Pendleton, Pleasants, Preston, Raleigh, Randolph, Summers, Upshur, Wayne, Webster and Wirt Counties.

Few typical specimens have been observed in West Virginia. Most of the material studied bears a more or less close resemblance to *V. triloba*, with which it appears to intergrade in our area.

3. ***Viola triloba* Schwein.** Three-lobed Violet. Plate 2.

A pubescent blue violet with some leaves 3-7-lobed.

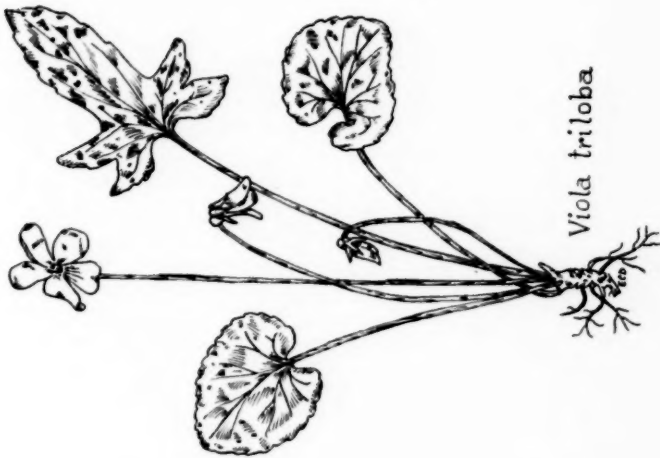
Rootstock knotted, horizontal or ascending, becoming elongated with age; earliest leaves broadly heart-shaped or reniform, broadly cordate at base, crenate, rounded at apex, purple beneath; leaves at flowering time 3-7-lobed, the middle segment large, usually about half the leaf surface; basal lobes lunate, lateral lobes, when present, narrow, some or all often more or less toothed; early leaves densely villous beneath and on the petioles; late summer leaves less cut, or entirely uncut, often nearly glabrous; peduncles mostly nearly glabrous, shorter than the best developed leaves; sepals ciliate; cleistogamous capsules ovoid, purplish; seeds buff or pale brown.

Widely distributed throughout the state in dry, open woods, especially in the mountains. Berkeley, Calhoun, Grant, Hampshire, Kanawha, Lewis, Mercer, Monongalia, Monroe, Morgan, Ohio, Raleigh, Summers, Taylor, Upshur, Wayne, Webster, and Wirt Counties.

The early season plant, when first in bloom and before the lobed leaves develop, is difficult to distinguish from *V. sororia*, with which it grows and apparently hybridizes. It is also confusing in late summer when nearly or quite glabrous leaves appear, variously cut, or



Viola sagittata



Viola triloba

uncut, reniform in outline, 10-15 cm. wide and often only half as long. Some plants seem never to develop any lobed leaves.

4. ***Viola sagittata*** Ait. Arrow-leaved Violet. Plate 2.

A blue violet with long-petioled, arrow-shaped leaves.

Rootstock short, stout, erect; plant glabrous or pubescent; the well developed leaves lanceolate or oblong-lanceolate, hastately or sagittately incised or toothed at the base, mostly acute at apex, the petioles normally much longer than the blades; earliest and late season leaves shorter petioled, oval or elongate-deltoid, crenate or slightly toothed at the base; peduncles equaling or slightly exceeding the leaves; sepals glabrous, acute, scarious-margined, their auricles not ciliate; cleistogamous flowers erect, their capsules green, 8-14 mm. long; seeds brown.

Moist and shady places, roadside ditches, or sometimes dry fields, widely scattered over the state. Specimens checked from Fayette, Grant, Hampshire, Hardy, Monongalia, Nicholas, Ohio, Pocahontas, Randolph, Summers, Tucker, Upshur, and Webster Counties.

The typical plant of moist banks and roadside ditches is glabrous. A robust, decidedly pubescent form (*V. subsagittata* Greene) is frequently found, usually in drier situations. The leaves of this form are often deeply lobed toward the base. In dry pastures a dwarf pubescent form occurs which tends toward *V. fimbriatula*. Some plants of this form from near Reedsville, Preston Co. were transplanted to our garden where, under favorable conditions, they developed more marked *V. sagittata* characters, but remained pubescent and comparatively dwarf. Seedlings appearing around them are similar to the parent plants. In many places, e.g., between Morgantown and Masontown, *V. sagittata* and *V. fimbriatula* grow in mixed colonies. From such a colony one may select fairly typical specimens of each species, but many intermediate forms also appear.

5. ***Viola fimbriatula*** J. E. Smith. Ovate-leaved Violet. Plate 3.

An ovate-leaved pubescent blue violet of dry, open places.

Rootstock usually erect, becoming long and stout with age; the entire plant usually pubescent, sometimes copiously so; in some races the leaf blades are essentially glabrous, the pubescence being confined to the peduncles and petioles; leaves ovate or ovate-oblong, crenate or crenulate toward the obtuse or acute apex, sharply toothed or incised toward the cordate, truncate, or abruptly tapering base; petioles mostly shorter than the leaf-blades, often more or less winged



Viola emarginata

Plate 3



Viola fimbriatula

above; flowers violet-purple, usually held well above the leaves; sepals lanceolate, acuminate, scarious margined, the spreading auricles often ciliate; cleistogamous flowers erect, their capsules green, ovoid, 6-10 mm. long; seeds brown.

Dry sandy or shaly soil, usually in the open, rather common in the south-eastern half of the state. Berkeley, Grant, Hampshire, Mercer, Monongalia, Preston, Raleigh, Randolph, Summers, Tucker and Upshur Counties.

This variable species runs into various races and forms in West Virginia. An exceedingly floriferous race from Gum Springs, Monongalia Co., with small, thin, triangular leaves has been growing in our garden for a number of years. The leaves are not incised at the base, being rather regularly serrate from the apex to the truncate base. The pubescence is confined to the peduncles and winged petioles. Another form from Dolly Sods Mountain, Randolph Co., has longer ovate leaves slightly incised at the sub-cordate base, sepals and auricles perfectly smooth, and no pubescence except scattered hairs on the peduncles. Natural seedlings of both come true to form in our garden.

6. *Viola emarginata* Le Conte. Triangle-leaved Violet. Plate 3.

Rootstock thick, branching so as to form large clumps under favorable conditions; plant glabrous; leaves at flowering time narrowly heart-shaped, about 5 cm. long by 3 cm. wide, cordate at base, often deeply so, crenate to below the middle, coarsely serrate around the basal lobes; mid-summer leaves triangular, shallowly cordate or truncate, coarsely doubly-toothed below the middle, crenate or coarsely dentate toward the obtuse apex; flowers large, about 2.5 cm. wide, numerous, held well above the rather long-petioled leaves; no emarginate petals observed; cleistogamous flowers on short, erect peduncles, the mature capsules green, up to 1.5 cm. long; the spreading auricles of their sepals often 2-3 mm. long; seeds dark lustrous brown.

In dry soil at edge of woods, apparently rare in West Virginia, only two stations being known to us; one in almost pure sand at the Flatts, Monongalia Co., where it is plentiful, the other consisting of a few plants on a bank near Amboy, Preston Co. This species has been mistaken in West Virginia for the northern *V. novae-angliae*.

7. ***Viola hirsutula*** Brainerd. Southern Wood Violet. Plate 4.

According to Brainerd, "This species is readily distinguished from all other stemless (blue) violets by having leaves pubescent above but glabrous beneath."

Rootstocks short and thick, or matted in old clumps; plant glabrous, except for a silvery pubescence on the upper surface of the often mottled leaves; leaves about 3 cm. wide, obtuse or acutish, usually appressed to the ground; petaliferous flowers violet-purple, held well above the leaves; the slender prostrate peduncles of the cleistogamous flowers gradually rise so that the ovoid purple capsules (6-8 mm. long) open and expose their yellow-brown seeds well above the leaves.

This attractive little violet is likely to be found in dry, open woods almost anywhere in the state. Calhoun, Fayette, Hampshire, Kanawha, Lincoln, Monongalia, Monroe, Pendleton, Pocahontas, Preston, Raleigh, Taylor, Wayne, and Webster Counties.

Late in the summer of 1937 three plants which appeared to be *Viola hirsutula* x *triloba* Brainerd were discovered near Quarry Run, Monongalia Co. The leaves had the delicately mottled silvery pubescent upper surface of *V. hirsutula*, and the lobed leaves and pubescent veins of *V. triloba*. One plant was transplanted to our garden where it failed to thrive, but produced a few blue and white striped flowers in 1938.

8. ***Viola sororia*** Willd. Downy Wood Violet. Plate 4.

A large-flowered pubescent blue violet of rocky woods.

Rootstock stout and horizontal, somewhat branching; leaves variable in outline, often triangular, deeply cordate, about as broad as long, crenate-dentate, typically pubescent, especially beneath; petioles thick, fleshy, and densely pubescent, especially when young; flowers ample, violet to lavender, on more or less pubescent peduncles about equalling the leaves; outer sepals ovate-oblong, often ciliate below the middle and on the short, rounded auricles; cleistogamous flowers on short, prostrate or spreading peduncles, their capsules usually purple; seeds dark brown.

In woods and shady places throughout the state, being especially common in the mountains. Berkeley, Cabell, Fayette, Grant, Greenbrier, Hampshire, Hardy, Lincoln, Marion, Marshall, Monongalia, Monroe, Nicholas, Pendleton, Pocahontas, Preston, Raleigh, Summers, Taylor, Wayne, Webster, and Wirt Counties.

Viola sororia varies greatly in leaf outline and in the amount of pubescence, some forms growing in open places being nearly glabrous. The thick, semi-succulent petioles of the young unfolding leaves seems to be one of its most constant characters. It appears at times to intergrade with *V. papilionacea*.

In 1937 we found a plant along a branch of Three Forks Creek, in Preston Co., which we identified as a hybrid between the present species and *V. triloba*. Both parent species are common in the vicinity. The next year we found a similar plant about half a mile distant. Both plants were transferred to our garden where they have grown for several years. The following description is from these growing plants and herbarium specimens taken from them:

***Viola sororia* x *triloba* Brainerd.**

Leaves about 5 x 5 cm., often broader than long, shallowly cordate at base, mostly rounded or obtuse at apex, some with an abrupt point; some leaves merely crenate-dentate, others variously lobed or incised, mostly below the middle, the indentations seldom reaching more than one-fourth the way to the midrib, always with a large crenate-dentate middle lobe; leaves somewhat pubescent on both sides; the fleshy young petioles densely pubescent as in *V. sororia*; the petals beautifully striped blue and white; flowers profuse and held slightly above the leaves.

These plants were both of considerable size when found, and developed into large clumps. In spite of the abundance of petaliferous flowers, and normal number of cleistogamous flowers, no seeds or seedlings were ever observed.

9. ***Viola papilionacea* Pursh. Butterfly Violet. Plate 5.**

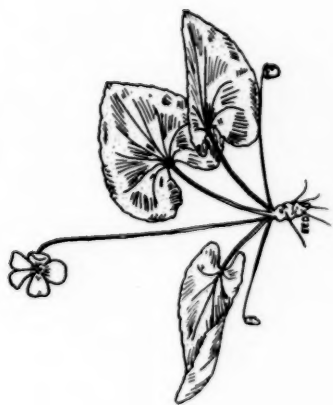
The common blue violet of cultivated grounds.

Rootstock stout, horizontal, branching, often forming mats several inches across; plants robust and usually glabrous, sometimes a little pubescent in lines along the petioles; leaves large, ovate or reniform, cordate at base, rounded or variously pointed at the apex; flowers deep violet, rarely white, on peduncles about equalling the leaves; cleistogamous flowers ovoid, on short horizontal peduncles, usually on or under the ground, but becoming erect before the ellipsoid or cylindric 10-15 mm. long dark purple (rarely green) capsules burst; the seeds dark brown, about 2 mm. long.

Very common throughout the state, being especially abundant in cultivated ground, about dwellings, and along streams. It doubt-



Viola sororia



Viola hirsutula

less occurs in every county. Specimens from Barbour, Brooke, Cabell, Fayette, Grant, Hampshire, Hardy, Harrison, Kanawha, Marshall, Monongalia, Monroe, Morgan, Nicholas, Ohio, Pleasants, Pocahontas, Preston, Raleigh, Randolph, Ritchie, Summers, Taylor, Tucker, Upshur, Wayne, Webster, Wirt, and Wood Counties.

Frequently whole colonies are found with considerable pubescence on the petioles and occasionally a little on the leaves.

On a dry hillside in Morgantown, now partially incorporated in our flower garden, is a considerable colony of luxuriant *V. papilionacea*. About one-third of the plants of this colony have many of their leaves deeply lobed, suggesting vigorous leaves of *V. palmata*. The leaves are more rugose than those of normal plants in the same colony. All other characters, including the large (8-10 cm. long) leaves and almost total lack of pubescence, are typical of *V. papilionacea*. There are no plants in the colony with intermediate characters.

10. ***Viola Priceana* Pollard.** Confederate Violet. Plate 5.

A rare papilionacea-type violet with "gray" flowers.

Rootstock thick, horizontal, usually branching; leaves of specimens observed in West Virginia deltoid, deeply cordate, crenate-dentate, obtuse at apex, about 5 cm. wide by 6 cm. long, slightly pubescent beneath and on the petioles when young; flowers white, suffused with blue so as to appear gray, decidedly darker toward the throat.

Apparently rare in West Virginia, known to us only from Grant Co., where it grows along the North Fork of Lunice Creek, in shady bottom land, and doubtfully from Pocahontas County.

This striking violet is included under *V. papilionacea* by Brainerd. It is here considered as distinct for reasons so aptly stated by J. K. Small in his *Manual of Southeastern Flora*.

We are of the opinion that the Confederate violet commonly cultivated in Morgantown is a form of *V. papilionacea*, and that it is distinct from the *V. Priceana* which grows along Lunice Creek.

11. ***Viola cucullata* Ait.** Blue Marsh Violet. Plate 6.

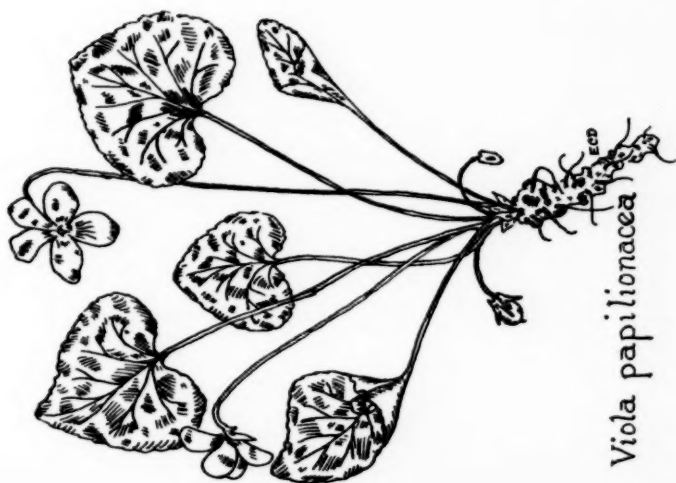
A tall blue marsh violet with flowers held high above the leaves.

Rootstock branching, becoming matted in old clumps; plant glabrous, or with a few hairs scattered along petioles and peduncles; leaves cordate, dentate-crenate, mostly acute to acuminate at apex,



Viola Priceana

Plate 5



Viola papilionacea

about 5 by 5 cm. at flowering time; petaliferous flowers large, typically blue-violet, usually darker toward the center, with a large white eye; the glabrous spurred petal shorter than the lateral ones; dense tufts of knobby beard on the lateral petals; the long, spreading auricles of the long, lanceolate sepals are distinctive; the peduncles are about 25 cm. long when the plant is thriving in its normal marshy habitat; cleistogamous flowers long and slender, on long, slender, erect peduncles, their capsules green, 1-1.5 cm. long; seeds over 1 mm. long, dark brown or nearly black.

Common throughout the state in open or shady marshy places, and along streams, probably growing in every county. Specimens seen from Barbour, Fayette, Hampshire, Marion, Mineral, Monongalia, Pendleton, Pocahontas, Preston, Randolph, Summers, Taylor, Tucker, Upshur, Wayne, Webster, Wetzel, and Wirt Counties.

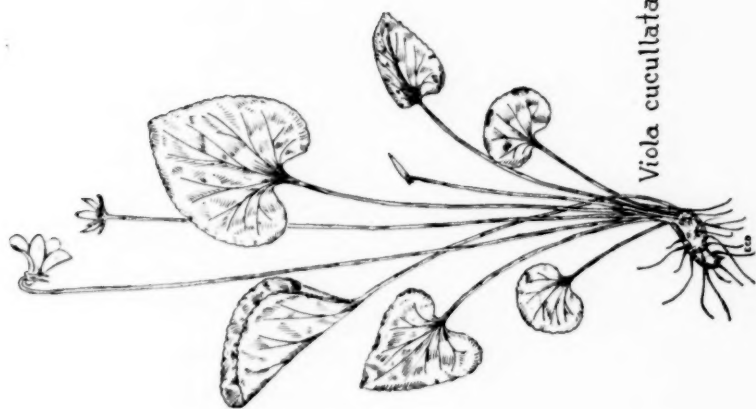
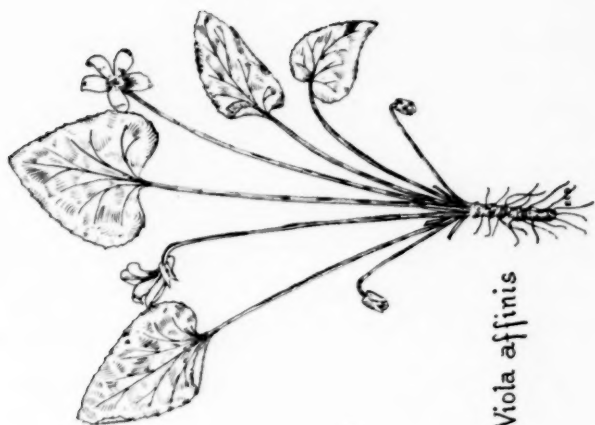
12. ***Viola affinis*** Le Conte. Le Conte's Violet. Plate 6.

A blue marsh violet with flowers held about as high as the leaves.

Rootstock horizontal or ascending, becoming matted in old clumps; plants glabrous or nearly so; leaves crenate-dentate, cordate, acute or acuminate at the apex; flowers violet, becoming lighter toward the center; sepals broader and shorter than in *V. cucullata*, with short, appressed auricles; petioles mostly shorter than the leaves; cleistogamous flowers small, ovoid, on rather long, ascending peduncles, their capsules ellipsoid, usually more or less purple dotted; sepals acuminate, half the length of the capsule which is 5-10 mm. long; seeds buff.

Marshy meadows, moist banks, and wet woods, or along streams, probably widely distributed in West Virginia. Berkeley, Grant, Marion, Monongalia, Nicholas, Pocahontas, Preston, Summers, Taylor, and Wirt Counties.

Le Conte named the present species "*affinis*" because he considered it of near affinity to *V. cucullata*. No name was ever more aptly chosen. While it is comparatively easy to go out in the field in May or June and select typical specimens of *V. cucullata* and of *V. affinis*, it is quite a different matter to say definitely to which species a given herbarium specimen should be referred. Points to be noted are:

*Viola affinis*

Viola cucullata

Peduncles longer than leaves.
 Flowers usually darker toward center.
 Cleistogamous flowers long and slender, on erect peduncles.
 Capsules 10-15 mm. long.
 Sepals lanceolate, nearly as long as the capsule.
 Auricles prominent (2-4 mm. long) and spreading.
 Ripe seeds dark brown.

Viola affinis

Peduncles shorter than or equaling leaves.
 Flowers usually lighter toward center.
 Cleistogamous flowers short, ovoid, on ascending peduncles.
 Capsules 5-10 mm. long.
 Sepals ovate, half as long as the capsule.
 Auricles short (less than 2 mm. long) and appressed.
 Ripe seeds buff.

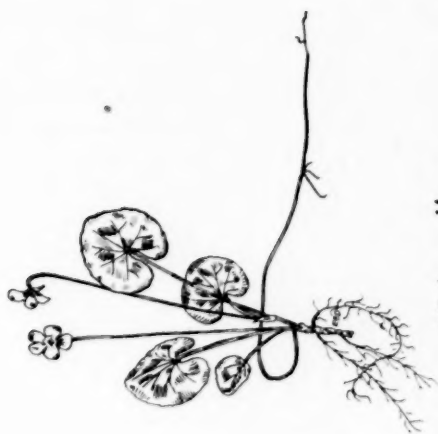
13. *Viola blanda* Willd. Sweet White Violet. Plate 7.

The common white stemless violet of cool woods.

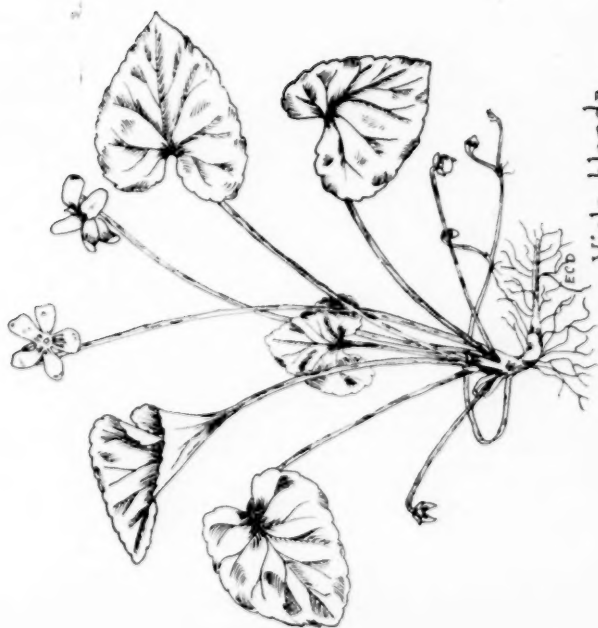
The slender rootstock horizontal, or sometimes erect, producing many long leafy runners in summer; leaves mostly 3-5 cm. wide, deeply cordate, acute or obtuse at the apex, glabrous except for scattered short white hairs on the upper surface of the basal lobes, margins shallowly crenate, the notches usually 3-5 mm. apart on well developed leaves; petioles and peduncles glabrous, usually tinged with red, the color often extending into the midrib and larger veins; flowers sweetly scented, about 1 cm. wide; petals white, the upper narrow and curled, the three lower with delicate purple veins, all beardless or nearly so; cleistogamous flowers plentiful in summer, on plants and runners, their peduncles spreading or ascending, often becoming erect as the seeds ripen; capsules oval; seeds straw colored.

In cool woods throughout the state. Specimens seen from Cabell, Calhoun, Fayette, Kanawha, Lincoln, McDowell, Monongalia, Monroe, Nicholas, Preston, Randolph, Raleigh, Ritchie, Summers, Tucker, Tyler, Upshur, Wayne, and Wirt Counties.

Viola blanda thrives in leaf mold among rocks in partial shade. Frequently a few petaliferous flowers appear in autumn. A few years ago in Sept.-Oct. the flowers were so plentiful in recently logged woods along Three Forks Creek, Preston Co., that one could have picked a hundred blossoms in a few minutes.



Viola pallens



Viola blanda

14. ***Viola pallens*** (Banks) Brainerd. Smooth White Violet. Plate 7.

A small round-leaved white violet of mountain bogs.

Rootstock very slender, usually erect; filiform runners produced in summer; leaves glabrous, about 3 cm. wide, cordate or reniform at base, almost orbicular in outline, rounded or obtuse at apex, remotely crenate; petioles and peduncles glabrous or with a few scattered hairs, not tinged with red; flowers smaller than in *V. blanda*, the upper petals not curled, the lateral often slightly bearded, purple veined, as in all the sweet violets; capsules small; seeds nearly black, smaller than in *V. blanda*.

This is a northern violet, confined, in West Virginia, to the mountains, growing in sphagnum bogs and along streams in open glades. Specimens seen from Nicholas, Pocahontas, Preston, Randolph, Tucker and Webster Counties.

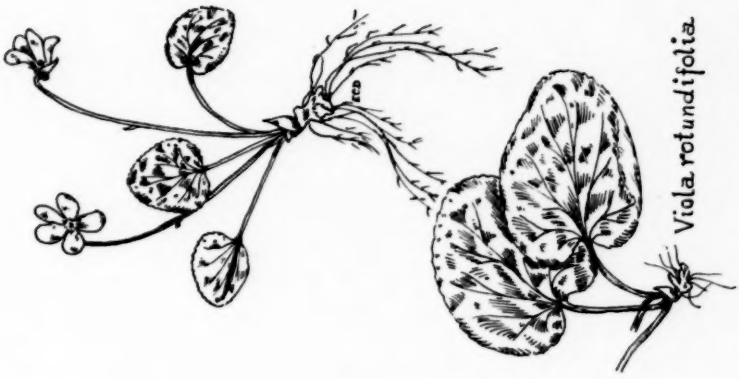
When growing in sphagnum, the slender, vertical rootstock is sometimes continued upward into a slender stem one or two centimeters long.

15. ***Viola primulifolia*** L. Primrose-leaved Violet. Plate 8.

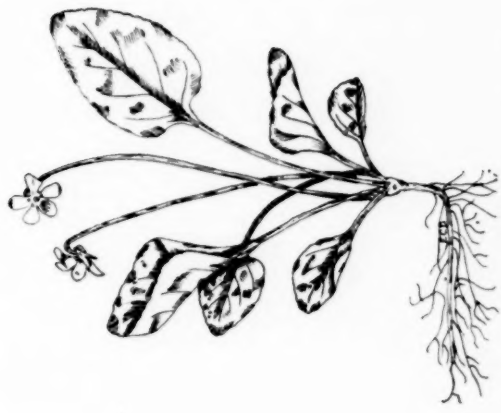
Rootstock long and slender, horizontally creeping, producing numerous stolons in summer; leaves ovate, crenate, glabrous or nearly so, obtuse at apex, tapering at base into a long, winged petiole, or truncate or rarely subcordate, 4-6 cm. long by 3-4 cm. wide; flowers white, delicately purple veined, up to one cm. long, three-quarters as wide; cleistogamous flowers in summer on erect peduncles shorter than the leaves, often on the leafy stolons; capsules about 1 cm. long; seeds reddish brown.

In marshy or almost dry situations, in West Virginia mostly in the mountains; plentiful locally. Barbour, Berkeley, Fayette, Monongalia, Nicholas, Pocahontas, Preston, Randolph, Summers, Upshur, and Webster Counties.

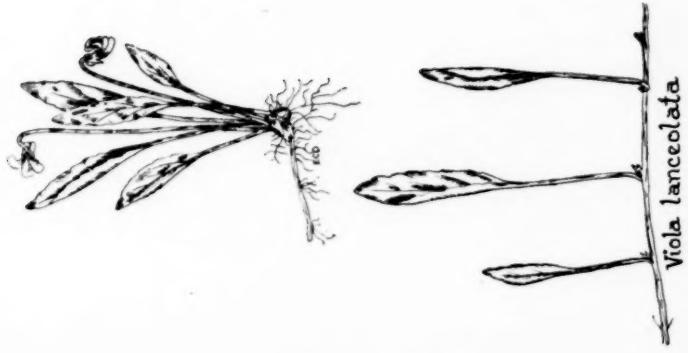
According to the current manuals, *V. primulifolia* is confined to the Atlantic and Gulf coastal plains. Brainerd, in his *Violets of North America*, writes: "This is the largest species of the white violets that grow in wet, open places, and has the widest range, extending along the coast from New Brunswick to Florida and Texas." Nevertheless, a dwarf form of it is one of the commonest plants in pastures on top of Point Mountain in Webster and Randolph Counties. The possibility that this plant of the West Virginia mountains might be a



Viola rotundifolia



Viola primulifolia



Viola lanceolata

different species from the *V. primulifolia* of the coastal plain should be investigated.

16. ***Viola lanceolata* L.** Lance-leaved Violet. Plate 8.

A little white violet of wet places, with narrow, tapering leaves.

Entire plant glabrous; vernal leaves lanceolate, crenate, about 1 cm. wide by 3 cm. long, acute or obtuse at apex, tapering at the base into an ample, margined, usually reddish petiole; leaves frequently much larger in summer; seeds dark brown; rootstock, runners, flowers, and capsules as in *V. primulifolia*.

In marshy or poorly drained pastures, apparently local in West Virginia. Hampshire, Hardy, Marion, Monongalia, and Upshur Counties. This delicate little violet is probably more plentiful than the records indicate, since it is so easily overlooked.

While naturally a plant of wet places, it thrives and spreads by seeds and stolons along the foot of, in, and on top of a loose stone wall on a dry hillside in our garden.

17. ***Viola rotundifolia* Michx.** Round-leaved Violet. Plate 8.

Our only stemless yellow violet.

Rootstock rough, becoming horizontal with age; vernal leaves orbicular or ovate, 2-3 cm. wide, cordate at base, obtuse or rounded at apex, repand-crenate, sparsely pubescent above with short white hairs; petioles more or less pubescent; petals yellow, the three lower with brown striations, sometimes chocolate tinted; capsules ovoid, 6-8 mm. long, finely purple dotted; seeds gray or nearly white; summer leaves almost orbicular, cordate at base, 6-10 cm. across, appressed to the ground; cleistogamous flowers in summer on prostrate leafless racemes; no leafy, rooting stolons as in the sweet white violets.

Rather common in cool, rich woods, especially in the mountains. Fayette, Monongalia, Pocahontas, Preston, Raleigh, Randolph, Summers, Tucker and Webster Counties.

This is one of our earliest violets, normally flowering in March and April in West Virginia.

18. ***Viola tripartita* Ell.** Three-parted violet. Plate 9.

A rare yellow violet with three-parted leaves.

Rootstock woody, brown, with coarse, fibrous roots; plant glabrous; leaves triangular in outline, three-parted or deeply three-lobed, the divisions or lobes coarsely toothed, cuneate; stipules ovate, entire, rather small.

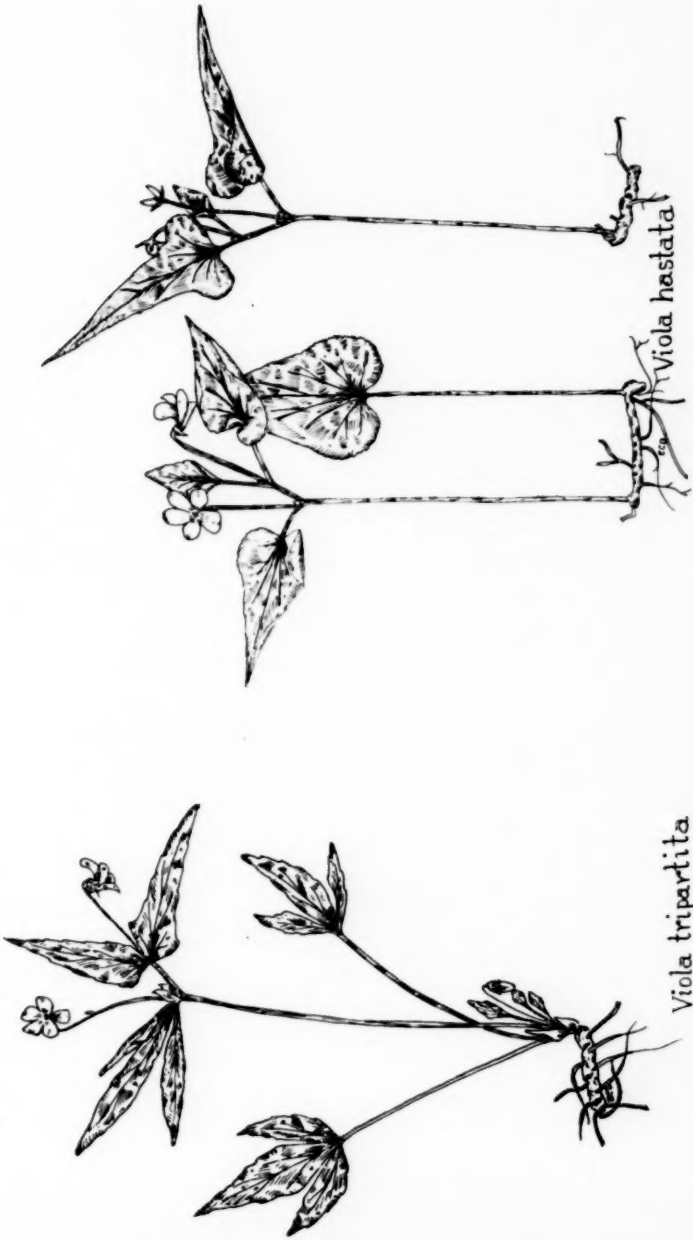


Plate 9

The only West Virginia station known for this southern violet is near Ft. Gay, Wayne Co., where it was collected by Isabelle Lycan (Mrs. G. A. Bowling).

This interesting violet is found chiefly in the mountains, especially in the Carolinas, where a variety with uncut leaves grows with the species. The variety, which has not yet been reported from West Virginia, is distinguished from *V. hastata* by its brown, woody rootstock and coarse, fibrous roots. Both the species and the variety should be sought in our southern counties.

19. ***Viola hastata* Michx.** Halberd-leaved Yellow Violet. Plate 9.

A yellow woods violet with the few hastate leaves clustered near the top of the stem.

Rootstock long, horizontal, subterranean-creeping, white, brittle; rootlets capillary; stems slender, glabrous, arising singly or in pairs at intervals along the rootstock; stem leaves mostly 2-4, clustered near the summit, halberd-shaped or heart-shaped, slightly serrate, acute at apex, shallowly cordate or truncate at base; larger leaves, more deeply cordate and dilated at base, with more prominent serrations, appear, usually singly, at intervals along the rootstock or at the base of a stem; stipules ovate, acute, entire or sparingly toothed, 2-4 mm. long; flowers yellow, 1.5-2 cm. long, lateral petals slightly bearded; spur very short; capsule glabrous.

Rather frequent in dry woods, mostly in the mountains. Specimens seen from Fayette, Monongalia, Nicholas, Preston, Raleigh, Randolph, Summers, Upshur, and Webster Counties.

In a densely shaded bottom along the Back Fork of Elk River in Webster Co., we found a considerable colony of *V. hastata* with all the leaves beautifully mottled as so often occurs in *V. hirsutula*. This mottling has been observed to a lesser extent in several other places.

A form with long, narrow leaves is frequently encountered.

20. ***Viola pubescens* Ait.** Downy Yellow Violet. Plate 10.

Our only yellow violet which is decidedly pubescent or downy.

Softly pubescent all over; stems 2-3.5 dm. high, erect, solitary or in pairs (rarely three), the 2-few stem leaves near the summit of the stem, and an occasional long-petioled erect basal leaf; leaves broadly ovate, decurrent, truncate or cordate at base, normally about 6 x 6 cm., often larger; usually 30-45 crenate dentations on each stem leaf; stipules ovate-oblong, acute, entire, about 1 cm. long when well developed; petals yellow, purple-veined, the lateral bearded; sepals

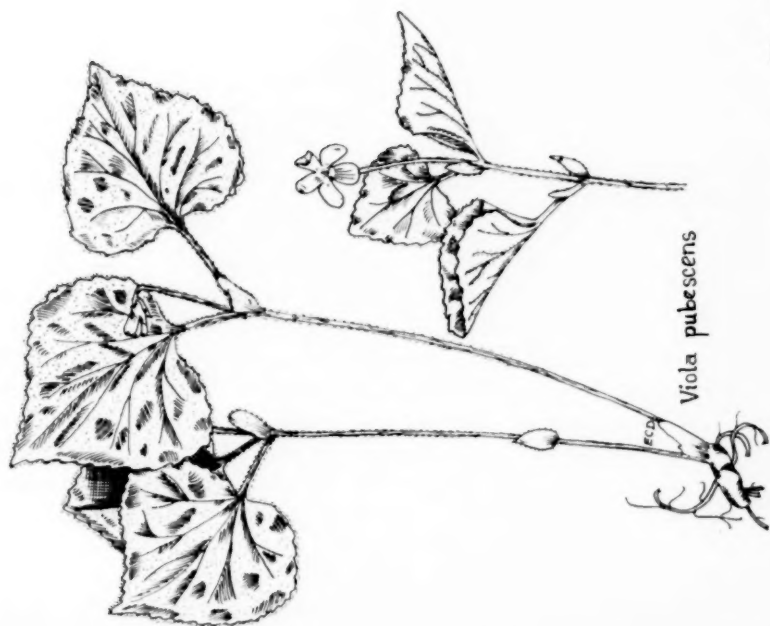
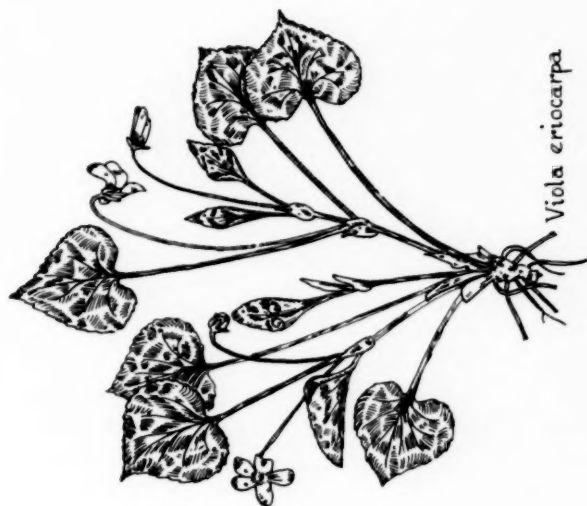


Plate 10

narrowly lanceolate; cleistogamous flowers in summer on short peduncles at top of stem, their capsules ovoid, smooth or pubescent; seeds light brown, 2-3 mm. long.

Frequent in dry, rich woods in the mountains and in the more northern hilly counties. Hampshire, Monongalia, Morgan, Ohio, Pendleton, and Preston Counties.

This is a northern species whose range extends southward in the mountains, reaching or approaching its southern limit in West Virginia. The most southern collection we have seen is from Pendleton Co. We should like to check specimens from more southern stations in order to determine the limits of its range.

21. ***Viola eriocarpa*** Schwein. Smooth Yellow Violet. Plate 10.

The common leafy-stemmed yellow violet.

Glabrous or often somewhat pubescent; stems mostly in clusters of 2-several, inclined, leafy from near the base, with a few or several spreading basal leaves; pubescence, when present, mostly confined to the petioles and veins on the under surface of the younger leaves; leaves broadly ovate, mostly with an abrupt acute point, cordate or truncate at the decurrent base, normally about 4 x 4 cm., with 25-35 crenate dentations on each stem leaf; stipules ovate, acute or acuminate, entire, mostly more than 1 cm. long; flowers, capsules, and seeds as in *V. pubescens*.

Common in moist, open woods in all sections of the state. There are specimens in the W. V. U. Herbarium from Berkeley, Brooke, Cabell, Calhoun, Fayette, Kanawha, Mercer, Mingo, Monongalia, Ohio, Pendleton, Pleasants, Pocahontas, Preston, Raleigh, Roane, Summers, Taylor, Tucker, Tyler, Upshur, Wayne, Wetzel, and Wirt Counties.

V. pubescens and *V. eriocarpa* have a tendency to intergrade, although no true hybrid of the two has ever been reported. (In fact, Brainerd, in his *Some Natural Violet Hybrids of North America*, describes 82 hybrids involving 25 blue and 5 white species, but does not mention a single hybrid involving a yellow violet.) *V. eriocarpa* starts blooming early, usually in April in West Virginia, when the plant is quite small with scarcely any stem. It continues to bloom as it develops, the several stems and basal leaves inclining outward in all directions from their common base. In *V. pubescens*, the few erect stems are well developed before the blossoms appear, in mid-May, well toward the top of the stem. The amount of pubescence is not a safe criterion for identification. Even the capsules vary from white-woolly to smooth in both species.

22. *Viola canadensis* L. Canada Violet. Plate 11.

Face of flower creamy-white, back purple-tinged.

Plant glabrous or nearly so throughout; stems often 4 dm. high, perhaps our tallest violet; stipules lanceolate, sharp pointed, about 1.5 cm. long; leaves normally about 8 cm. long by 6 cm. wide, heart shaped, serrate, cordate at base, acute or acuminate at apex; petaliferous flowers appear at intervals throughout the summer, the earliest ones often 2.5 cm. wide, white on the face with a yellow eye, the spurred petal striped with fine, dark lines; the spur very short; the backs of the upper petals flushed with purple; lateral petals bearded; sepals long and narrow, sharp pointed; capsules subglobose, 6-10 mm. long, often pubescent or puberulent; seeds brown.

In rich woods throughout the state, especially in the mountains. Cabell, Calhoun, Fayette, Kanawha, Lincoln, Monongalia, Ohio, Pendleton, Pleasants, Pocahontas, Preston, Roane, Summers, Tucker, Upshur, Wayne, and Wetzel Counties.

23. *Viola striata* Ait. White Striped Violet. Plate 11.

Our common leafy-stemmed white violet.

Glabrous or nearly so; stems tufted, leafy, ascending or spreading, often long and prostrate in summer; stipules mostly 1.5-2.5 cm. long, oblong-lanceolate, sharply serrate or laciniate, the teeth narrow and pointed; leaves heart-shaped, finely crenate-serrate, normally about 3-4 cm. across, obtuse or acute at apex; flowers creamy white, about 1.5 cm. across, veined with blue; lateral petals bearded; spur about 4 mm. long; capsule ovoid, glabrous, about 5 mm. long; seeds light brown.

Found in low, moist situations, frequently along small streams. This is our most common leafy-stemmed violet, and no doubt occurs in every county in the state. Barbour, Berkeley, Brooke, Cabell, Calhoun, Fayette, Grant, Greenbrier, Hampshire, Hardy, Harrison, Jefferson, Kanawha, Lincoln, Marion, Marshall, Mercer, Mineral, Mingo, Monongalia, Nicholas, Ohio, Pendleton, Pocahontas, Preston, Raleigh, Randolph, Ritchie, Summers, Taylor, Tyler, Upshur, Wayne, Webster, Wetzel, and Wirt Counties.

There is a colony of *V. striata* in Webster Co. which probably deserves varietal standing. The upper petal is very short; all five petals are deeply suffused with purple, fading toward the tip, paler on the back; spur purple; leaves noticeably thick and rugose. This colony was reported to us by Mrs. Martha Cunningham, who has had

it under observation for many years. Plants obtained from her produce many seedlings in our garden, all true to form.

24. ***Viola rostrata*** Pursh, Long-spurred Violet. Plate 12 .

A leafy-stemmed blue violet with a spur more than 1 cm. long.

Glabrous or nearly so; stems several from a woody rootstock, more or less inclined; stipules lanceolate, normally about 1 cm. long, sharply dentate or laciniate; leaves heartshaped, or the earliest reniform, about 3 by 3 cm., serrate, cordate at base, the upper acute or pointed at the apex; flowers up to 2 cm. across, often much smaller, pale lilac, veined with blue, darker toward the center; petals beardless; the spur slender, straight or curved, 1-1.8 cm. long on well developed flowers; capsule ovoid, 3-5 mm. long, glabrous; seeds yellowish brown.

Rich rocky woods, common in the mountains. Specimens checked from Calhoun, Fayette, Grant, Kanawha, Lincoln, McDowell, Monongalia, Pocahontas, Preston, Raleigh, Randolph, Ritchie, Roane, Summers, Taylor, Tyler, Upshur, Wayne, and Webster Counties.

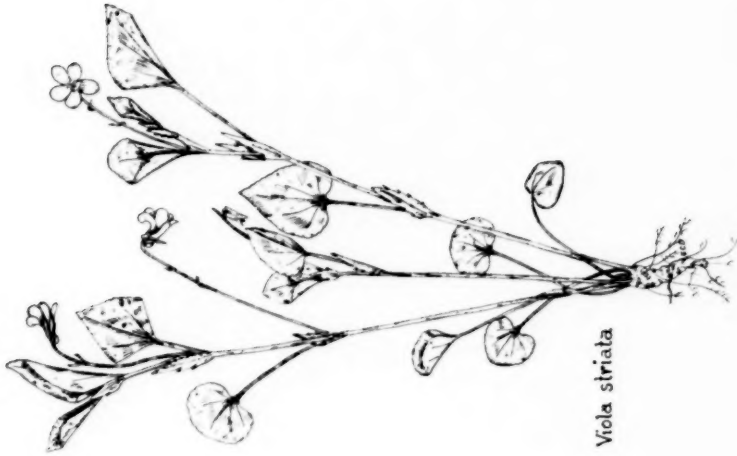
There is great variation in the size and shade of the flowers in this species. A small colony with pure white flowers has been under observation for a number of years near Greer, Monongalia Co. These plants are apparently true albinos, for the foliage is a light green color. The foliage of normal *V. rostrata* has a decided purplish cast. Such white flowered forms occur in many, possibly all, of the blue violets.

Along Booth Creek, Monongalia Co., is a colony of violets which we believe to be

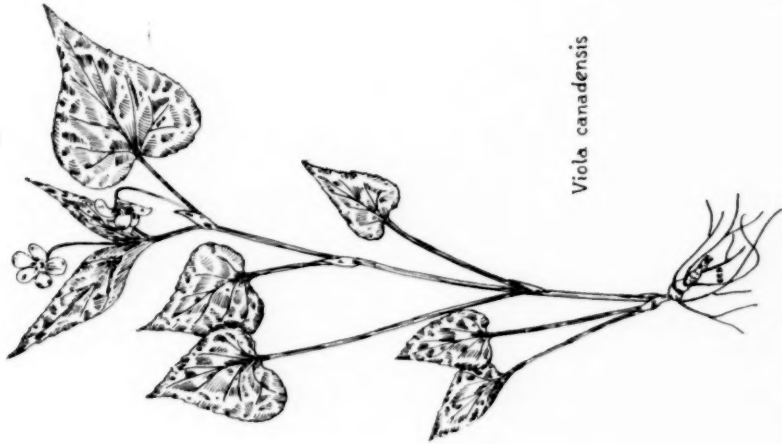
Viola rostrata* x *striata Brainerd.

The following description is based on herbarium specimens from this small colony:

Stems several, ascending, about 4 dm. tall, purplish, glabrous; stipules 1.5-2.5 cm. long, ovate-lanceolate, sharply serrate with inward-curving teeth toward the base, the upper half nearly entire; lowest leaves reniform, rounded at apex, crenate, about 2 cm. long by 3 cm. wide; upper leaves heart-shaped, cordate at base, acuminate, serrate, mostly 5-6 cm. long by 4-5 cm. wide; petals pale blue, striate, sometimes the upper, sometimes the lateral, bearded; spur 7-8 mm. long, abruptly curved upward at the blunt point; sepals linear, about 10 mm. long by 1 mm. wide.



Viola siriata



Viola canadensis

In many respects *V. conspersa* appears to be intermediate between *V. rostrata* and *V. striata*. The present hybrid differs from *V. conspersa* in being a more robust plant with larger, more pointed leaves; larger, less deeply cut stipules; longer, curved spur; longer and narrower sepals; and purple stem.

25. ***Viola conspersa*** Reichenb. American Dog Violet. Plate 12.

A leafy-stemmed violet with small, obtuse leaves and pale blue flowers.

Rootstock oblique, usually branched; stems several, ascending; plant glabrous or nearly so; stipules 1-1.5 cm. long, ovate-lanceolate, laciniate-toothed, the sharp pointed upper third almost entire on the upper ones; leaves round-cordate, or the lower round-reniform, crenate, obtuse at apex, normally about 3 by 3 cm.; flowers pale blue or nearly white, raised above the foliage, the lateral petals slightly bearded; spur about 5 mm. long; seeds straw-colored.

Rather widespread in cool, shady places, mostly in the valleys of the mountain counties. Specimens seen from Barbour, Fayette, Hampshire, Monongalia, Pocahontas, Preston, and Webster Counties.

A colony of this species with especially large, beautiful, pale blue to pure white flowers occurs in rocky woods near the mouth of White Day Creek, Monongalia Co.

26. ***Viola Walteri*** House. Prostrate Blue Violet. Plate 13.

The slender, prostrate stems root at the nodes, forming extensive mats under favorable conditions.

Plant glabrous or nearly so, only about 5-8 cm. high, although the slender, prostrate stems may be 2 or 3 dm. long; stipules about 5 mm. long, narrowly lanceolate or linear, sparsely laciniate-toothed; leaves orbicular, about 2 by 2 cm., cordate at base, rounded or very obtuse at the apex, crenulate, sometimes finely puberulent; the early flowers appear from rosettes of radical leaves, later ones, both petaliferous and cleistogamous, appear on capillary peduncles from the axis of the prostrate stem; petaliferous flowers small, 1-1.5 cm. across, pale violet; lateral petals bearded; capsules ovoid, glabrous, about 6 mm. long, equalling the lanceolate sepals; seeds straw-colored.

Rare in West Virginia, in open woods or along streams in the mountains. Recorded from Nicholas, Preston, Webster, and Tucker Counties.

This dainty southern violet was first found in West Virginia in 1937 near Reedsville, Preston Co., growing among grass in a

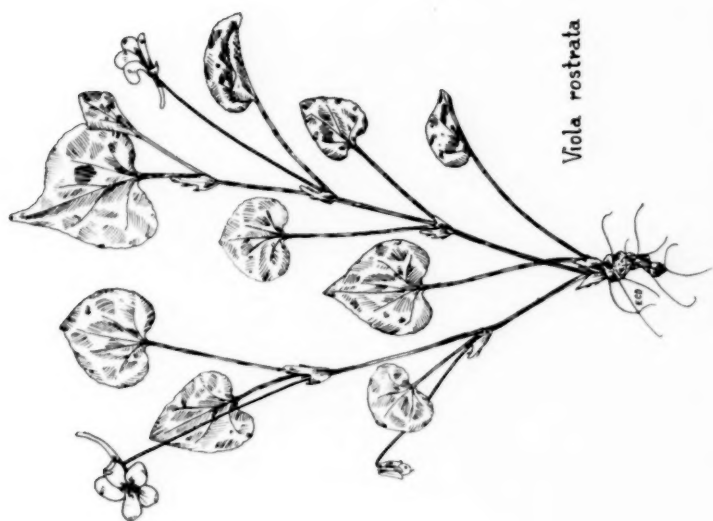
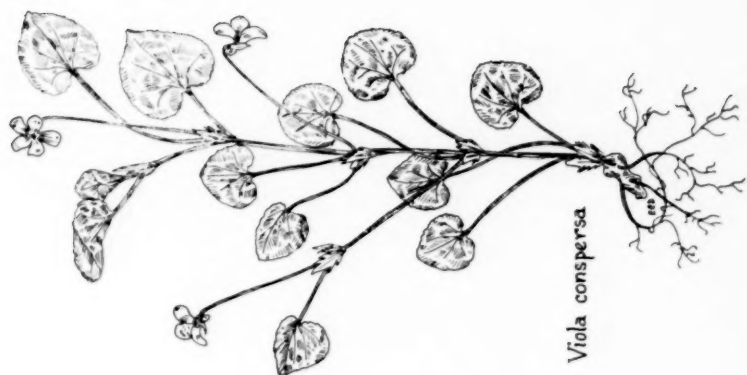


Plate 12

pasture along a branch of Deckers Creek. A considerable area of a hillside pasture near Eglon, Preston Co., is blue with it in the spring. It is also plentiful along the Blackwater River above Route 32. Some years ago Mr. J. E. Harned discovered a large colony along the Youghiogheny River near Oakland, Md. In 1941 we found what is perhaps the most northern known station near Salisbury, Pa. Thus the range of *V. Walteri* — given as Kentucky to Florida and Texas in the current manuals — has been extended northward a considerable distance in recent years.

In spring, rosettes of leaves and stems appear at intervals along the rooted stem of the previous season, which then serves as a rhizome. The little leaves, at least when growing in the open, rustle when brushed — a property we have noticed in no other violet.

27. ***Viola Rafinesquii* Greene.** Wild Pansy. Plate 13.

Our only annual Violet.

Stems about 10-15 cm. high, simple or branched below, nearly or quite glabrous; stipules 1-2 cm. long, leaf-like, lyrate-pinnatifid, the lanceolate or linear divisions ciliate, the stipules about equal in outline to the leaves; early leaves nearly orbicular, about 5 mm. across, on slender petioles 1 cm. long; later leaves larger, obovate to linear-oblongate, tapering at base into rather short, winged petioles; sepals ovate, acute, ciliate, about 5 mm. long; flowers variable in size, the pale bluish-lavender to creamy-white petals up to 1 cm. long; capsules glabrous, about 5 mm. long.

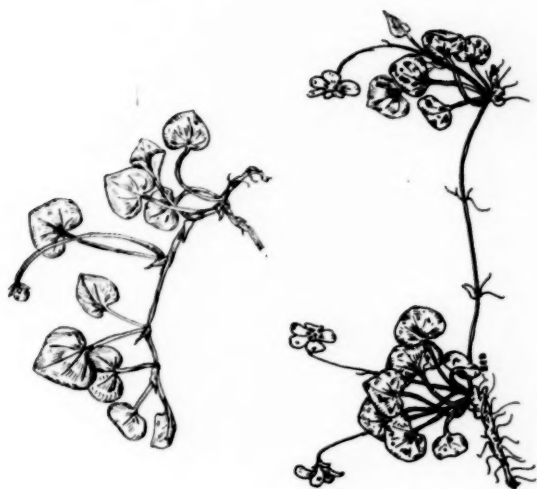
Common locally in dry pastures, banks, and open woods. There are specimens in the Herbarium from Berkeley, Cabell, Calhoun, Grant, Greenbrier, Hampshire, Hardy, Lincoln, Mercer, Monongalia, Morgan, Pendleton, Pocahontas, Raleigh, Summers, and Wayne Counties.

This dainty little violet is a winter annual, often in bloom by the first week in April. It frequently appears in open places in thick, well defined patches with few stragglers, as if sown. Perhaps the next year the colonies will appear elsewhere in the same field, with few or no plants in the areas so thickly populated the previous season. Such local migrations have been observed in other winter annuals.

Some authors consider *V. Rafinesquii* to be native to the Eastern States, while others think it was introduced from Europe.



Viola Rafinesquii



Viola Walteri

28. **Hybanthus concolor** (Forster) Spreng. Green Violet. Plate 14.

A tall, weedy plant of the Violet family.

Rootstock woody and knotted; stems several, erect, 3-7 dm. tall, more or less hairy throughout; (glabrous or nearly so in forma *subglabratus* Eames); stipules lanceolate, sharp-pointed, about 1 mm. long; leaves oblong, normally 5-15 cm. long by 2.5 cm. wide, entire or with a few shallow dentations near the apex, attenuate at apex, tapering to a short petiole at base; flowers greenish-white, in racemes of 1-3 in the axils of the alternate leaves; peduncles and pedicels 1-8 mm. long; sepals linear, 3-4 mm. long, without auricles; petals about equalling the sepals, the lower twice as broad as the others, gibbous at base, forming a rudimentary spur; capsule oblong, glabrous, about 2 cm. long.

Local in rich woods west of the mountains. Cabell, Calhoun, Marshall, Mercer, Monongalia, Ohio, Preston, Raleigh, Ritchie, Summers, Tyler, Wayne, and Wirt Counties. We have seen no specimens from the eastern counties, or from the mountains.

The green violet is the only member of the violet family found in West Virginia which does not belong to the genus *Viola*.

The superficial resemblance of *Hybanthus concolor* to the unrelated *Lithospermum latifolium*, with which it frequently grows, is quite striking. The rootstock, stems, and leaves of the two plants are so similar that differentiation between them is difficult early in the season before the flowers appear. The flowers are, of course, quite different.

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Hybanthus concolor

Plate 14

WEST VIRGINIA UNIVERSITY MORGANTOWN

Inland Plants on the Gulf Coastal Plain of Georgia*

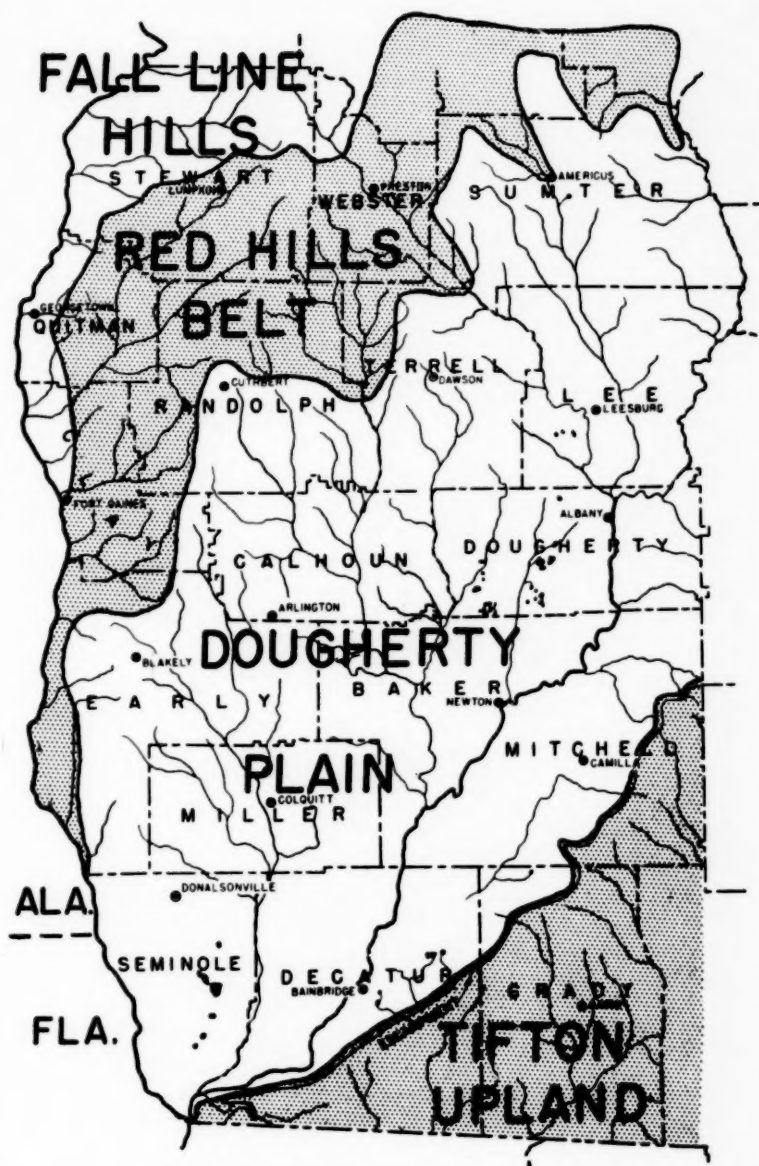
ROBERT F. THORNE

The Eocene Red Hills Belt of the Gulf Coastal Plain in southwestern Georgia lies between the sandy Fall Line Hills to the northwest and the sandy pinelands of the Dougherty Plain to the southeast. It is a level to rolling plateau dissected by deep valleys. The flat-topped divides reach elevations of 400 to 600 or more feet above sea-level and often stand more than 100 feet above the valley floors. The Chattahoochee River, which here forms the boundary between Georgia and Alabama, is bordered in many places by high, steep bluffs, and smaller tributary streams enter it through gorges. The headwater branches of streams tributary to both the Chattahoochee and Flint Rivers create a much-dissected terrain. The soil for the most part is a reddish sandy-loam or clay-loam probably derived largely from the underlying early Tertiary formations.

The steep slopes of the moist ravines and of the bluffs along the Chattahoochee River in this area are forested with rich woods of Piedmont aspect. Mixed with Coastal Plain plants are many species not ordinarily found on the Coastal Plain. These latter plants are more northern or inland in their distribution, being either widespread throughout the eastern forests or limited largely to the Appalachian Highlands. Dr. R. M. Harper (1904, 1905) noted this mixing of species of unlike affinities in the area, and listed some of the plants of more northern range.

The writer, accompanied in the field for extended periods of time by Dr. W. C. Muenscher of Cornell University, carried on a botanical survey of the southwestern corner of Georgia during most of 1947 and parts of the growing seasons of 1946 and 1948. During this period much time was spent studying the plant communities and constituent species in the Red Hills area, especially in Clay and Randolph Counties and the northwestern and western parts of Early County. Quadrat counts and censuses of the woody plants of ravines, particularly in the vicinity of Fort Gaines near the Chattahoochee River, were made to obtain accurate data on the relative abundance of woody species on the richly-wooded slopes.

*Presented September 10, 1948 before the joint session of the Systematic Section of the Botanical Society of America and the American Society of Plant Taxonomists, Washington, D. C.



Physiographic Divisions of Southwestern Georgia.

The following table lists the more frequent or otherwise characteristic vascular plants of the rich deciduous woods of ravine slopes in the Red Hills Belt. Although by no means a complete list of the plants collected in the area, it is presented to acquaint the reader with the rich woods of the Red Hills Belt. The abundance of inland species mingling with decidedly Coastal Plain species is readily apparent from this list.

**PARTIAL LIST OF VASCULAR PLANTS OF RICH, DECIDUOUS WOODS
IN THE RED HILLS BELT OF THE GULF
COASTAL PLAIN OF GEORGIA**

I. Trees, in approximate order of abundance:

<i>Fagus grandifolia caroliniana</i>	<i>Acer rubrum</i>
<i>Quercus alba</i>	<i>Acer leucoderme</i>
<i>Carya glabra</i>	<i>Diospyros virginiana</i>
<i>Liriodendron Tulipifera</i>	<i>Halesia diptera</i>
<i>Acer barbatum</i> (<i>A. floridanum</i>)	<i>Magnolia virginiana</i>
<i>Quercus borealis maxima</i>	<i>Quercus stellata</i>
<i>Tilia americana heterophylla</i>	<i>Viburnum rufidulum</i>
<i>Nyssa sylvatica</i>	<i>Prunus serotina</i>
<i>Liquidambar Styraciflua</i>	<i>Ulmus rubra</i>
<i>Carya tomentosa</i>	<i>Juniperus virginiana</i>
<i>Pinus glabra</i>	<i>Cercis canadensis</i>
<i>Pinus Taeda</i>	<i>Magnolia pyramidata</i>
<i>Magnolia macrophylla</i>	<i>Quercus coccinea</i>
<i>Ostrya virginiana</i>	<i>Quercus velutina</i>
<i>Quercus laurifolia</i>	<i>Quercus nigra</i>
<i>Magnolia grandiflora</i>	<i>Castanea dentata</i>
<i>Quercus Muhlenbergii</i>	<i>Fraxinus biltmoreana</i>
<i>Oxydendrum arboreum</i>	<i>Magnolia tripetala</i>
<i>Quercus falcata</i>	<i>Carpinus caroliniana</i>
<i>Fraxinus americana</i>	<i>Prunus americana</i>
<i>Cornus florida</i>	<i>Morus rubra</i>
<i>Ilex opaca</i>	<i>Amelanchier arborea</i>

II. Shrubs and lianas:

<i>Rhapidophyllum Hystrix</i>	<i>Hamamelis virginiana</i>
<i>Smilax Bopa-nox</i>	<i>Calycanthus floridus</i>
<i>Smilax glauca</i>	<i>Rubus Enslenii</i>
<i>Smilax pumila</i>	<i>Crataegus spathulata</i>
<i>Smilax Smallii</i> (<i>S. lanceolata</i>)	<i>Crataegus viridis</i>
<i>Smilax rotundifolia</i>	<i>Ptelea trifoliata</i>
<i>Smilax tanniioides</i>	<i>Sebastiania fruticosa</i>
<i>Smilax tanniioides hispida</i>	<i>Rhus radicans</i>
<i>Castanea pumila</i>	<i>Ilex montana mollis</i> (<i>I. Beadlei</i>)
<i>Celtis tenuifolia georgiana</i>	<i>Evonymus americana</i>
<i>Xanthorhiza simplicissima</i>	<i>Aesculus parviflora</i>
<i>Asimina parviflora</i>	<i>Aesculus Pavia</i>
<i>Cocculus carolinus</i>	<i>Rhamnus caroliniana</i>
<i>Hydrangea arborescens</i>	<i>Vitis rotundifolia</i>
<i>Hydrangea quercifolia</i>	<i>Parthenocissus quinquefolia</i>
<i>Decumaria barbara</i>	<i>Dicra palustris</i>

Cornus alternifolia
Cornus stricta
Aralia spinosa
Rhododendron canescens
Rhododendron minus
Rhododendron prunifolium
Kalmia latifolia
Leucothoe axillaris
Vaccinium Elliottii
Vaccinium melanocarpum
Halesia carolina

III. Herbaceous plants:

Botrychium virginianum
Adiantum Capillus-Veneris
Asplenium platyneuron
Athyrium Filix-femina asplenioides
Dryopteris hexagonoptera
Polypodium polypodioides
Polystichum acrostichoides
Melica nutica
Oplismenus setarius
Panicum Boscii
Panicum commutatum
Sphenopholis nitida
Stipa avenacea
Uniola sessilifolia
Carex crebriflora
Carex debilis
Carex digitalis
Carex oligocarpa
Carex striatula
Carex styloflexa
Carex Willdenovii
Scleria oligantha
Arisaema quinatum
Arisaema triphyllum pusillum
Tillandsia usneoides
Luzula acuminata
Luzula echinata
Chaenactium luteum
Erythronium americanum
Lilium carolinianum
Medeola virginiana
Polygonatum biflorum
Smilacina racemosa
Uvularia perfoliata
Veratrum intermedium
Trillium Catesbaei
Trillium sessile (T. Hugerii)
Croonia pauciflora
Simulax Hugerii
Smilax herbacea
Hymenocallis occidentalis
Hypoxis hirsuta
Dioscorea villosa glabrifolia
Iris verna
Sisyrinchium angustifolium

Symplocos tinctoria
Chionanthus virginica
Osmanthus americana
Gelsemium sempervirens
Callicarpa americana
Bignonia capreolata
Mitchella repens
Viburnum acerifolium
Viburnum dentatum
Lonicera sempervirens

Corallorhiza Wisteriana
Hexalectris spicata
Malaxis unifolia
Ponthieva racemosa
Tipularia discolor
Aristolochia Serpentaria
Asarum arifolium
Arenaria lanuginosa
Silene ovata
Anemone virginiana
Anemonella thalictroides
Hepatica americana
Thalictrum revolutum
Sanguinaria canadensis
Heuchera americana
Tiarella cordifolia austrina
Agrimonia microcarpa
Amphicarpa bracteata
Desmodium glutinosum
Desmodium nudiflorum
Erythrina herbacea
Phaseolus polystachios
Vicia Hugerii
Geranium maculatum
Euphorbia corollata
Viola palmata
Viola sororia (V. papilionacea)
Viola tripartita
Viola Walteri
Passiflora lutea
Sanicula canadensis
Sanicula Smalii
Thaspium barbinode Chapmanii
Thaspium trifoliatum
Zizia aurea
Zizia trifoliata
Monotropa uniflora
Spigelia marilandica
Amsonia Tabernaemontana
Asclepias variegata
Vincetoxicum alabamense
Phlox carolina heterophylla
Phlox divaricata
Phlox pilosa
Cynoglossum virginianum

Collinsonia anisata
 Collinsonia canadensis
 Salvia lyrata
 Aureolaria virginica
 Pedicularis canadensis
 Ruellia carolinensis
 Conopholis americana
 Epifagus virginiana
 Phryma leptostachya
 Galium circaezans
 Galium uniflorum
 Houstonia purpurea
 Aster lateriflorus
 Aster sagittifolius
 Aster undulatus
 Brickellia cordifolia

Coreopsis auriculata
 Eupatorium incarnatum
 Eupatorium purpureum
 Hieracium marianum
 Lactuca floridana villosa
 Polymnia Uvedalia
 Prenanthes altissima
 Prenanthes serpentaria
 Senecio obovatus
 Solidago Boottii
 Solidago brachyphylla
 Solidago caesia
 Solidago discoidea
 Solidago notabilis
 Vernonia ovalifolia

Among the inland plants collected in southwestern Georgia during the survey, the following apparently have not been reported previously from the Coastal Plain of Georgia: *Trillium Vaseyi* Harbison, richly wooded ravine slope two miles northwest of Cuthbert, Randolph County, T. and M.* 7938. *Salix rigida* Muhl., along small stream one mile east of Georgetown, Quitman County, T., M., and S. J. Smith 3147; along Colomokee Creek south of Fort Gaines, Clay County, T. 3799 (according to Dr. C. R. Ball, this willow is an addition to the flora of Georgia). *Quercus montana* Willd., dry slopes, Providence Canyons, eight miles west of Lumpkin, Stewart County, T. and M. 7723. *Arenaria patula* Michx., limestone outcrops at Greer Cave north of Cuthbert, Randolph County, T. and M. 7676 and 7924. (Not previously reported from Georgia.) *Silene ovata* Pursh, richly-wooded ravine slopes near Fort Gaines, Clay County, T. 6987, T. and M. 8519. *Aquilegia canadensis* L., calcareous woods near Greer Cave, Randolph County, T. and M. 7695 and 7902. *Trautvetteria carolinensis* (Walt.) Vail, boggy swamp south of Hilton, Early County, T. 4965 and 6032, T. and M. 8589. *Magnolia tripetala* L., richly-wooded ravine slopes, few miles northwest of Cuthbert, Randolph County, T., M., and S. J. Smith 3117, T. and M. 7953; ravine tributary to Hog Creek, two miles west of Coleman, Randolph County, T. and M. 8220 (associated here with four other magnolias, *M. pyramidata* Bartr., *M. macrophylla* Michx., *M. grandiflora* L., and *M. virginiana* L.). *Vicia Hugerii* Small, ravine slopes two miles northwest of Cuthbert, Randolph County, T. and M. 7744 and 7754; rich woods near Greer Cave, Randolph County, T. and M. 7908; richly-wooded ravine slopes near Fort Gaines, Clay County, T. and M. 7853.

*T. = R. F. Thorne, M. = W. C. Muenscher.

Ilex montana Torr. & Gray, var. *mollis* (Gray) Britt. (= *Ilex Beadlei* Ashe), ravine slopes near Fort Gaines, Clay County, T. 6943, 6983, 6998; bluff along Chattahoochee River, west of Hilton, Early County, T. 7387a; dry woods northwest of Cuthbert, Randolph County, T. and M. 8236. *Fraxinus biltmoreana* Beadle, ravine slopes near Fort Gaines, Clay County, T. 6994a and 7467a. *Phacelia dubia* (L.) Trelease, Kolomoki Mounds State Park, Early County, T. and M. 7976. *Chelone glabra* L. (the typical subspecies), springy place along ravine near Gilbert Landing on the Chattahoochee River, Early County, T. 7273. *Scrophularia marilandica* L., bank of the Chattahoochee River near Neel Landing Bridge, Seminole County, T. 7180. *Hieracium venosum* L., dry slopes, Providence Canyons, Stewart County, T. 3470, T. and M. 7726.

Many other inland plants considered rare on the Gulf Coastal Plain have been collected recently in southwestern Georgia. These may be presented in two lists: those species not reported from Florida, and those species known from as far south as northern Florida and restricted there largely to the richly-wooded hills of the Tallahassee and Marianna regions and to the bluffs along the Apalachicola River. These plants are arranged phylogenetically in the following two tables.

TABLE I

INLAND PLANTS RARE ON THE COASTAL PLAIN OF GEORGIA
AND NOT REPORTED FROM FLORIDA

<i>Species</i>	<i>Southernmost County in Georgia from which Collected</i>
<i>Adiantum pedatum</i> L.	Clay
<i>Brachyelytrum erectum</i> (Schreb.) Beauv.	Randolph
<i>Carex Frankii</i> Kunth	Clay
<i>Luzula acuminata</i> Raf.	Decatur
<i>Luzula echinata</i> (Small) Hermann	Decatur
<i>Lilium superbum</i> L.	Calhoun
<i>Polygonatum canaliculatum</i> (Muhl.) Pursh	Randolph
<i>Smilacina racemosa</i> (L.) Desf.	Early
<i>Smilax tamnioides hispida</i> (Muhl.) Fern.	Early
<i>Trillium Catesbaei</i> Ell.	Early
<i>Trillium vaseyi</i> Harbison	Randolph
<i>Salix rigida</i> Muhl.	Clay
<i>Corylus americana</i> Walt.	Lee
<i>Castanea dentata</i> (Marsh.) Borkh.	Clay
<i>Quercus coccinea</i> Wang.	Early
<i>Quercus montana</i> Willd.	Stewart
<i>Arenaria patula</i> Michx.	Randolph

<i>Silene ovata</i> Pursh	Clay
<i>Claytonia virginica</i> L.	Early
<i>Anemone virginiana</i> L.	Randolph
<i>Aquilegia canadensis</i> L.	Randolph
<i>Magnolia tripetala</i> L.	Randolph
<i>Menispermum canadense</i> L.	Early
<i>Arabis canadensis</i> L.	Randolph
<i>Podostemon ceratophyllum</i> Michx.	Baker
<i>Heuchera americana</i> L.	Clay
<i>Tiarella cordifolia austrina</i> (Lakela) Wherry	Early
<i>Robinia Pseudo-Acacia</i> L.	Early
<i>Vicia Hugerii</i> Small	Clay
<i>Geranium maculatum</i> L.	Randolph
<i>Ilex montana mollis</i> (Gray) Britt.	Early
<i>Staphylea trifolia</i> L.	Seminole
<i>Acer leucoderme</i> Small	Clay
<i>Hybanthus concolor</i> (Forst.) Spreng.	Randolph
<i>Cryptotaenia canadensis</i> (L.) DC	Seminole
<i>Sanicula marilandica</i> L.	Decatur
<i>Zizia aurea</i> (L.) Koch.	Randolph
<i>Chimaphila maculata</i> (L.) Pursh	Calhoun
<i>Rhododendron minus</i> Michx.	Early
<i>Fraxinus biltmoreana</i> Beadle	Clay
<i>Cynoglossum virginianum</i> L.	Early
<i>Chelone glabra</i> L.	Early
<i>Orobanche uniflora</i> L.	Randolph
<i>Houstonia purpurea</i> L.	Early
<i>Eupatorium rugosum</i> Houtt.	Early
<i>Hieracium venosum</i> L.	Stewart
<i>Prenanthes altissima</i> L.	Clay
<i>Solidago patula</i> Muhl.	Early

TABLE II

INLAND PLANTS RARE ON THE COASTAL PLAIN OF GEORGIA BUT
REPORTED FROM AS FAR SOUTH AS
NORTHERN FLORIDA

<i>Species</i>	<i>Southernmost County in Georgia from which Collected</i>
<i>Athyrium Filix-femina asplenioides</i> (Michx.) Farwell	Decatur
<i>Dryopteris hexagonoptera</i> (Michx.) C. Chr.	Early
<i>Pellaea atropurpurea</i> (L.) Link	Randolph
<i>Woodsia obtusa</i> (Spreng.) Torr.	Early
<i>Botrychium virginianum</i> (L.) Sw.	Early
<i>Carex oligocarpa</i> Schk.	Decatur
<i>Arisaema quinatum</i> (Nutt.) Schott.	Clay
<i>Erythronium americanum</i> Ker.	Decatur
<i>Medeola virginiana</i> L.	Randolph
<i>Polygonatum biflorum</i> (Walt.) Ell.	Decatur
<i>Smilax Hugerii</i> (Small) J. B. Norton	Early
<i>Smilax herbacea</i> L.	Decatur
<i>Trillium sessile</i> L. (T. Hugerii Small)	Decatur
<i>Uvularia perfoliata</i> L.	Decatur
<i>Carya cordiformis</i> (Wang.) K. Koch	Decatur
<i>Carya ovata</i> (Mill.) K. Koch	Baker
<i>Salix tristis</i> Ait.	Lee

*Southernmost County
in Georgia from
which Collected*

Species

<i>Quercus borealis maxima</i> (Marsh.) Sarg.	Early
<i>Quercus Muhlenbergii</i> Engelm.	Early
<i>Ulmus rubra</i> Muhl.	Decatur
<i>Stellaria pubera</i> Michx.	Early
<i>Anemone caroliniana</i> Walt.	Dougherty
<i>Anemonella thalictroides</i> (L.) Spach.	Clay
<i>Delphinium carolinianum</i> Walt.	Randolph
<i>Hepatica americana</i> (DC.) Ker.	Early
<i>Trautvetteria carolinensis</i> (Walt.) Vail	Early
<i>Xanthorhiza simplicissima</i> Marsh.	Clay
<i>Magnolia macrophylla</i> Michx.	Clay
<i>Podophyllum peltatum</i> L.	Early
<i>Sanguinaria canadensis</i> L.	Decatur
<i>Hydrangea arborescens</i> L.	Early
<i>Philadelphus grandiflorus</i> Willd.	Early
<i>Physocarpus opulifolius</i> (L.) Maxim.	Early
<i>Euphorbia commutata</i> Engelm.	Decatur
<i>Evonymus atropurpureus</i> Jacq.	Early
<i>Acer saccharinum</i> L.	Seminole
<i>Viola tripartita</i> Ell.	Decatur
<i>Dirca palustris</i> L.	Decatur
<i>Panax quinquefolium</i> L.	Clay
<i>Sanicula gregaria</i> Bicknell	Decatur
<i>Kalmia latifolia</i> L.	Decatur
<i>Monotropa Hypopitys</i> L.	Early
<i>Monotropa uniflora</i> L.	Decatur
<i>Gentiana Saponaria</i> L.	Early
<i>Phlox carolina heterophylla</i> (Beauv.) Wherry	Decatur
<i>Phlox divaricata</i> L.	Decatur
<i>Collinsonia anisata</i> Sims.	Decatur
<i>Collinsonia canadensis</i> L.	Clay
<i>Scrophularia marilandica</i> L.	Seminole
<i>Conopholis americana</i> (L.f.) Wallr.	Baker
<i>Phryma Leptostachya</i> L.	Randolph
<i>Viburnum acerifolium</i> L.	Early
<i>Campanula americana</i> L.	Lee
<i>Antennaria plantaginifolia</i> (L.) Rich.	Calhoun
<i>Erigeron pulchellus</i> Michx.	Randolph
<i>Senecio obovatus</i> Muhl.	Decatur

How and when plants from the Appalachian Highlands and Interior Provinces reached the Coastal Plain of southern Georgia may only be conjectured. It is of some significance that the Chattahoochee River rises in northern Georgia in the Blue Ridge Province. Most of the plants mentioned in this paper were found along or near this river or its tributaries. The Apalachicola River, which bisects the panhandle of Florida, is merely a continuation of the Chattahoochee River after its junction with the Flint. Thus the areas in southwestern Georgia and northern Florida which offered habitats suitable for the ecesis of plants of deciduous forests were within easy

access of disseminules of more northern species that might have been carried down the Chattahoochee River. The geologically recent Pleistocene Ice Age no doubt facilitated this southward migration.

Even before the advent of glaciation in the North millions of years were probably available for the chance transmissal from the Inland Provinces of the species under consideration. All the formations of the inner Gulf Coastal Plain of Georgia are of Cretaceous or Tertiary age. The Upper Cretaceous formations which underlie the Fall Line Hills just to the north of the Red Hills Belt have perhaps been exposed in part since the end of the Mesozoic. The Red Hills Belt, though underlain largely by Paleocene and early Eocene formations, was at least partially covered by the Vicksburg sea which overlapped the Eocene deposits in late Oligocene time. Hence, it is doubtful if this hilly area was available for plant occupation before the close of the Oligocene epoch. Cook (1939) shows the early Pleistocene shorelines as extending up the Flint and Chattahoochee Rivers, but it is unlikely that the invasions of early Pleistocene seas inundated the Red Hills Belt.

The possibility that some of the species not usually considered as Coastal Plain plants entered southwestern Georgia from a Floridian refugium should be mentioned. Woodson (1947) has recently produced biological evidence from his study of *Asclepias* to support stratigraphic evidence that a fluctuating archipelago occupied what is now northern Florida from the Oligocene, or perhaps even the Eocene, to Pliocene time. It seems to the writer unnecessary to assume a more ancient refugium to explain the many endemic species and subspecies present in northern Florida and southern Georgia. Such plants as *Torreya taxifolia* Arn., *Taxus baccata* L., ssp. *floridana* (Chapm.) Pilg., *Croonia pauciflora* (Nutt.) Torr., *Salix floridana* Chapm., and *Brickellia cordifolia* Ell. may be remnants of a widespread, mesic Tertiary vegetation which found refuge in northern Florida during periods of climatic stress. Other plants of similarly restricted range may be derivatives of such relicts. *Uvularia floridana* Chapm., *Magnolia pyramidata* Bartr., *Thaspium barbinode* (Michx.) Nutt., var. *Chapmanii* Coult. and Rose, and others are not very distinct from their closest relatives to the north.

SUMMARY

The Eocene Red Hills Belt of the Gulf Coastal Plain in southwestern Georgia supports a vegetation more Piedmont than Coastal Plain in composition and general appearance. Mixed with such

Coastal Plain plants as *Magnolia grandiflora*, *Pinus glabra*, *Rhaphidophyllum Hystrix*, and *Tillandsia usneoides* are a much larger number of species more abundant in the Appalachian Highlands and Interior Provinces. A list of the more frequent or otherwise characteristic plants of the Red Hills Belt is given. Fifteen species not previously reported from the Coastal Plain of Georgia are enumerated, and tables listing more than one hundred inland species found during a recent botanical survey by the writer in southwestern Georgia are included. A possible explanation of the presence of inland plants in this physiographic division of the Gulf Coastal Plain is presented. Specimens of all the species mentioned in the paper will be deposited in the Wiegand Herbarium of Cornell University. The writer wishes to express his appreciation to Professor W. C. Muenscher, of Cornell University, who spent months with him in the field, and to Captain M. H. Goodwin, Jr., of the United States Public Health Service and Director of the Emory University Field Station at Newton, Georgia, for making this study possible.

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CORNELL UNIVERSITY
ITHACA, N. Y.

NOTES and NEWS

WILBUR H. DUNCAN, *Editor*

RECENT PUBLICATIONS OF INTEREST TO SOUTHERN APPALACHIAN BOTANISTS

Phylogeny in the Ericaceae

Members of this family are abundant in the Southern Appalachian region. Accordingly, *Studies in the comparative anatomy of the Ericales I. Ericaceae—Subfamily Rhododendroideae*,—Hiden T. Cox, American Midland Naturalist 39: 220-245, 1948 should be of interest to many persons. Although many of the details presented might not be useful certain parts would seem to be of considerable value to individuals in other fields. For example, of interest to taxonomists is the presentation of the phylogenetic relationships of tribes and genera based on anatomical and morphological characteristics.

Characters for separation of four species of *Cacalia* L.

Differences in achene characters and germination in some species of Cacalia L.—H. C. Greene, American Midland Naturalist 39: 758-759, 1948. The range of each of the four species includes the Southern Appalachian area. The achene characters presented should be of value taxonomically.

Ferns of Tennessee

Dr. Jesse M. Shaver of George Peabody College for Teachers, Nashville, published *Some General Notes on Ferns* in the October, 1942, number of the Journal of the Tennessee Academy of Science. Since that time, he has published periodically various articles on Tennessee ferns. Dr. Shaver continues these publications in two 1948 numbers of the Journal, Vol. 23: No. 2, pp. 111-119, 123-130; and No. 4, pp. 258-274. These pages are on the genera *Dryopteris*, *Phegopteris*, *Polystichum*, and *Cystopteris*. The articles include photographs of habitat and habit, drawings of typical material and variations as well, descriptions and notes on variability and other interesting features of the ferns, and detailed distribution maps. These articles are to be continued.

Students of plant geography may find some value in reading *Physical bases of agriculture in Dyer County, Tennessee*, Journal of the Tennessee Academy of Science 23: 215-235, 1948. This county, which borders the Mississippi River, is discussed on the basis of physiographic character, basic climatic conditions, natural vegetation and forests, soils, and physical regions. The field work apparently was carefully done and the data presented should be useful in helping understand plant distribution along the central Mississippi River.

Grasses of North Carolina*

An excellent printing job has been done on this publication; a good grade of paper was used and the illustrations and smaller print are quite clear. The text is in keeping with the quality of the printing and shows that the twelve years of study were intensive and careful. A striking attribute of the drawings is the life-like portrayal of the various parts shown. Inflorescences appear in proper shape and proportion to the rest of the plant. Careful attention has been given to the shape of glumes, lemmas, and other structures. Pubescence and awning are illustrated accurately. Drawings not done by the author show the results of his supervision and good choice of material.

Although in finer print than the main part of the text the keys are easy to read and follow, because of the clear print and progressive numbering of the characters. The use of page numbers after each genus in the keys will surely be welcomed by all, especially those who have used Hitchcock's *Manual of Grasses of the United States*. Description of each species, usually includes the most useful characters for accurate checking of material. Distribution within and without the state is given for each grass, that within being indicated clearly for most grasses by the 298 dot maps which are all placed not too conveniently near the back of the book. It is not made clear what the dots represent but one would assume that they are locations from which specimens examined by the author were collected.

A most practical feature of the manual is a key to the common grasses of fields, gardens, lawns, pastures, and other distributed areas, based on vegetative characters. The illustrations for this key allow ready interpretation of the characters used. This vegetative key alone will contribute much to the usefulness of the manual. In general complete synonymy and taxonomic revisions are omitted. The author

*The Grasses of North Carolina. H. L. Blomquist. Duke University Press. 1948. 276 pp., 249 figs., 298 maps. \$7.50.

states that "From the taxonomic standpoint, the aim has been to avoid confusion in so far as possible. Taxonomic revisions in a publication of this kind would lead to complications where simplification is desired." Limited use to date by the reviewer indicates a most useful manual and one that is remarkably free of errors, both editorial and scientific.

Since most adjacent states in the Southeastern U. S. have essentially the same grass flora as North Carolina, *The Grasses of North Carolina* will be a necessity for those studying grasses from the Southeastern U. S. Omission of species from out of the area allows a more rapid keying and detailed distribution data aid greatly in interpreting the distribution of the various species in adjacent states.

LOBELIA SEEDS WANTED

1. Seeds of the following species are urgently needed:

L. brevifolia Nutt., *L. glandulifera* (A. Gray) Small, *L. amoena* Michx., *L. glandulosa* Walt. Any fresh collections of *L. puberula*, *L. elongata*, *L. siphilitica*, and *L. Cardinalis* will also be much appreciated. It is best to take seed from several dozen plants in a population. Record locality and date. The seed should be very ripe when collected. If unripe, the plants may be dug and transferred to a convenient spot (keep moist) until the seed is ripe, or the flowering stalks may be cut and placed in jars of water in a sunny place until ripe.

2. It is always helpful to have a wild specimen for each collection though this is not as important as collecting good ripe seed. If the collector would like part of the material returned to him after it has been identified, plenty of material should be collected and a note attached requesting identification and return of duplicate material.
3. Seeds may be sent by letter; herbarium specimens by parcel with a customs declaration form stating "dried plant specimens, for scientific study only".
4. Address seeds and specimens to Dr. Wray M. Bowden Division of Botany and Plant Pathology, Canada Experimental Farm, Ottawa, Canada.

Reprints should be ordered when galley proof is returned to the editor. Morgantown Printing & Binding Co., Morgantown, W. Va., have furnished the following rates:

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